

atmospheric conditions as are our Pacific species. At all events the matter deserves further examination.

STANFORD UNIVERSITY, CALIFORNIA.

MUTUAL IRREGULARITIES IN OPPOSITE LEAVES

BY FRANCIS E. LLOYD

It is not uncommon to find that the leaves of the lilac (*Syringa vulgaris* L.), which are generally supposed to present little variation in shape, become notched on one side. A tooth or a lobe of considerable size may thus be formed, so that the simple cordate leaf is then lobed asymmetrically. The lobe is sometimes of quite regular form and ends in a fine tooth at the tip. It is moreover supplied with veins which give it a normal appearance. At other times it is more rounded; or there may be nothing more to suggest it than a rounded irregularity on the margin, accompanied by a slight warping of the leaf blade near by.

Now it has further been observed that when such an irregularity occurs, the leaf opposite—the leaves being in decussating pairs—has with few exceptions a similar lobing, but on the *other* side of the midrib; and therefore, since the ventral surfaces of the leaves are opposed in the bud, on the same side of the axis of the stem. A considerable number of similar instances have been observed by me in some other plants with opposite simple leaves, namely in *Lonicera* and *Forsythia*. What appears at first blush to be a variation of the same kind may occur also in compound leaves, and such a case I have found in the European ash, in which the terminal leaflets of a pair of opposite leaves showed mutual variations but in this case on the *same* side of the midrib. In one of the leaflets a lateral lobe only was formed, while on the other a complete lateral leaflet appeared in the corresponding position. The condition recalls that which arises in the juvenile opposite leaves of some plants (*Phascolus*) and in the alternate leaves on the new shoots of others (*Rubus occidentalis*, *R. nigro-* some cases rarely, if ever, uncovered. Farther north on the Atlantic coast, *Fucus edentatus* De la Pyl. and *F. serratus* L. are found near the low-water mark and do not as a rule become very dry at the ebbing of the tide.—ED.]

baccus, and *Rhus radicans*, the last with four or five partial or complete leaflets) or again on the older parts of the Japanese ivy (*Parthenocissus tricuspidata*).

Setting aside these cases of the ash and other compound-leaved plants, the explanation of the above-described phenomenon is to be found in the behavior of the leaf fundamentals in the buds. In the case of the lilac the pair of youngest leaves is so disposed in the bud that the ventral surfaces of the two are faced and that their margins lie each against the other, and match exactly. As the leaves enlarge their blades become thinner and so curved that one leaf comes to be infolded by the other. It sometimes happens however that during the time that blades begin to overlap, the margins, as the result of unequal growth or pressure cross one another at one or more points, and further development is retarded at those places. That this crossing is the cause of the notching or lobing there can be no doubt, since I have found a pair of leaves in which the notches were so deep that the blades became too closely interlocked to be able, during their expansion from the bud, to separate.

That other irregularities of form, also, such as a sudden narrowing of the blade toward the apex, are due to similar causes, is apparent from the circumstance that these, too, are often asymmetrically mutual in opposite leaves, and that upon careful examination, other evidences of compression are to be seen.

Examination of the leaf fundamentals in *Lonicera* and *Forsythia* shows that the above explanation is undoubtedly correct for them also. Whether a similar mechanical explanation is true also for the ash I have some doubt, and the cases of analogous appearances in alternate leaves cited are still more puzzling.

That the variations in the ash occur on the same side of the leaflets speaks against the application of the same explanation must be admitted, although it is to be noted that in the lilac the variations are sometimes mutual in the same way, namely on the same side of the midrib. This is to be explained by the fact that the crossing of the leaf margins does not always set up a disturbance of growth in both leaves involved at once.

This apparently unimportant phase of the study of leaf varia-

tions has, so far as I can learn, not been noticed before, and such variations may have but trifling significance.

It would be interesting in this connection to know whether these abnormal appearances, if we may call them such, are more frequent in leaves which appear in the spring—those therefore whose fundamentals were laid down during the previous growing season—for we might suspect that the formation of the stiff, resistant bud scales of the winter buds, both during their first formation and their subsequent more or less irregular early spring development, would set up rather more pronounced, if not different, mechanical conditions than the scales or leaves of the more evenly developing summer buds.

I have to thank Miss Mary E. Hart for first drawing my attention to the variations in lilac leaves, and Miss Elsie M. Kupfer, who at my suggestion searched for and found a good number of fine examples of the same thing.

TEACHERS COLLEGE, COLUMBIA UNIVERSITY.

A KEY TO THE NORTH AMERICAN SPECIES OF LACTARIUS—I

BY F. S. EARLE

The species of this genus are at once distinguished from all other mushrooms by the flowing of a more or less abundant milky juice when cut or wounded. Many of the species are exceedingly acrid or peppery when raw but as is the case with the nearly allied *Russulas* this is said to disappear on cooking and most of the species are considered to be edible. So far as known, none of them contains a poison. As a rule they require longer cooking than most other mushrooms.

The most important paper on our American species is that by Peck in the 38th Report of the New York State Museum, in which he gives a synopsis and full descriptions of the species known to occur in the State. Of the following seventy-six species and varieties that have been reported as occurring in North America thirty-one have been described by Professor